

## Microarray Analysis of Toxic genomic Effects of Hydrogen Peroxide, Peracetic Acid, and Sodium Hypochlorite on *Staphylococcus aureus*

Freshteh Toghrol

Senior Science Advisor

U.S. EPA Office of Pesticide Programs (OPP)/Microarray Research Laboratory

(410) 305-2755

Toghrol.Freshteh@epa.gov

**Authors:** Freshteh Toghrol<sup>1</sup>, Wook Chang<sup>2</sup>, David A. Small<sup>2</sup>, William E. Bentley<sup>2</sup>

<sup>1</sup>Office of Pesticide Programs, Microarray Research Laboratory, Biological and Economic Analysis Division, Ft. Meade, MD

<sup>2</sup>Center for Biosystems Research, University of Maryland Biotechnology Institute, College Park, MD

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Hospital-acquired infection (HAI) causes enormous casualties and economic damages each year because of the varieties of pathogenic bacteria that have grown resistant to many drugs and antimicrobials. *Staphylococcus aureus*, one of the major causes of HAI, has long been a serious threat to public health because of its manifold toxins and antimicrobial resistance. It is the most common cause of nosocomial pneumonia and surgical wound infections and the second most common cause of nosocomial bloodstream infections. Despite the fact that disinfectants, including oxidative compounds, have been employed to eradicate this pathogen, there is a lack of understanding of the mechanisms involved in antimicrobial activity and resistance. This hinders successful disinfectant applications in healthcare facilities.

The OPP's Microarray Research Laboratory is learning how antimicrobial agents affect bacteria. The aim of our recent study is to better elucidate the response of *S. aureus* (upon exposure) to oxidative disinfectants at the genetic level through the use of microarray technology. The genome-wide transcriptional responses can then be used for more comprehensive determination of biological function in cells. In this study, active ingredients of many hospital-level disinfectants, such as hydrogen peroxide, peracetic acid, and sodium hypochlorite, were selected as target chemicals. Multiple exposure times were employed to examine genes associated with protective mechanisms. Briefly, *S. aureus* was incubated with these oxidants at concentrations that led to strong growth inhibition, but not cellular death. Total RNA was then extracted and reverse-transcribed to cDNA, and labeled cDNA was hybridized onto the Affymetrix *S. aureus* GeneChip array. RT-PCR was then used to test the validity of the microarray data. The resulting global transcriptional profile can help identify signature genes that are commonly activated with oxidative disinfectants.

### Illustrations

Colorful graphic representation of (1) the effects of hydrogen peroxide, sodium hypochlorite, and peracetic acid on *Staphylococcus aureus* growth; (2) methodology (e.g., RNA quality); and (3) scatter plots of hybridization signals from *S. aureus* microarray experiments.